

Claims:

1. A system comprising means for executing application sessions in an electronic device with one or more processors, and means for scheduling Resource Reservation Instances as well as the execution of substantially simultaneous application sessions, **wherein** the application session to be executed comprises one or more Activity Blocks in one or more Activity Block Containers, and an execution order is specified for said Activity Blocks; the system further comprising
5 resource type specific Resource Handlers for reserving resources for the application session, Resource Allocation Manager for analysing and saving the resource allocation situation, Application Session Management and Scheduling means for selecting at least the next application session and Activity Block to be executed on the basis of
10 said resource allocation situation, executing means for executing the next Activity Block in the course of the selected application session, and the system is provided with a protocol connecting the Resource Handlers, Resource Allocation Manager, Application Session Management and Scheduling means and executing means, to control
15 the execution order and to implement the transfer of information between said Resource Handlers, Resource Allocation Manager, Application Session Management and Scheduling means, and executing means.
20
25 2. The system in accordance with Claim 1, comprising means for bookkeeping of the resource allocation situation, means for transmitting a first control message to an Activity Block to provide control information on the resource allocation to the Activity Block at the time of the initiation of the Activity Block, and means for transmitting a second control message at the time of the completion of the execution of the Activity Block to provide information about the resources reserved or released by the Activity Block to update the bookkeeping of the resource allocation situation after the completion of each Activity Block.
30
35 3. The system according to Claim 2, comprising means for an application session to reserve the resources needed by each Activity

Block, as well as to release them, either directly from the resource type specific Resource Handlers or from the Resource Allocation Manager that enable the queuing of reservation request messages, on the basis of control parameters received in a first control message

5 received from Application Session Management and Scheduling means.

4. The system in accordance with Claim 2, comprising means for making the Resource Reservation Instances created on a request from

10 the application session, via the use of second Control messages, dynamically available to different Activity Block Containers involved in the execution of the session, as needed.

5. The system in accordance with the Claim 1, comprising an

15 Operating System with scheduling functions, and for synchronizing the reservation, release and other resource-related control from the Application Session Management and Scheduling means, Activity Block Containers, Resource Allocation Manager, and Resource Handlers, there is a Session Control Protocol composed of application-

20 independent control messages and rules on their use, which is arranged during its operation to implement the synchronization and scheduling control of the execution of the Application Session Management and Scheduling means, the Activity Block Containers, the Resource Allocation Manager, as well as the Resource Handlers, on

25 the basis of the task switching functions of the Operating System as well as the OS task priorities defined for the Application Session Management and Scheduling means, the Activity Block Containers, the Resource Allocation Manager, and the Resource Handlers.

30 6. The system in accordance with the Claim 1, comprising a Resource Instance Table per each Resource Handler to provide the resource allocation situation to said resource management and allocation means, and the synchronization of the Resource Allocation Manager with respect to the Resource Handlers is arranged to be determined so

35 that substantially immediately after each execution turn of the Resource Handlers it is the turn of the Resource Allocation Manager,

wherein the resource allocation situation is unambiguously known in the Resource Instance Tables regarding the latest changes occurred.

- 5 7. The system in accordance with Claim 6, **wherein** the synchronization of the Resource Allocation Manager with respect to the Application Session Management and Scheduling means is determined so that substantially immediately after each execution turn of the Resource Allocation Manager it is the turn of the Application Session
- 10 Management and Scheduling means, wherein the resource allocation situation is unambiguously known regarding the latest changes occurred, and values can be determined by the Application Session Management and Scheduling means for the parameters of the control messages generated by it for the synchronization of the use of various types of Resource Reservation Instances.
- 15 8. The system in accordance with the Claim 1, wherein an End State Module is placed at the end of each Activity Block to complete the execution of the block, and a Waiting State Module is placed in the
- 20 Activity Block Container holding the Activity Block, and that the execution control of the Activity Block Container holding the Activity Block is arranged to generate a second Control message in the End State Module and to pause the execution in the Waiting State Module in order to wait for a first control message from the Application Session
- 25 Management and Scheduling means, wherein the execution of the application session is temporarily interrupted regarding the current Activity Block Container.
- 30 9. The system in accordance with Claim 8, wherein the Application Session Management and Scheduling means are arranged to analyse the resource allocation situation and the scheduling of the sessions to be executed to detect an overload condition of one or more resources and to manage it by replacing, as needed, application sessions with other application sessions requiring less resources, or by delaying, as needed, the transmission of first control messages to the application sessions, which results in a temporary suspension of the ongoing
- 35

application session or in a delayed initiation of a new application session.

10. The system in accordance with the Claim 1, wherein the Activity
5 Blocks of the application session are placed in one or more Activity Block Containers, that Activity Blocks in any one of these Activity Block Containers are arranged to be executed temporally at different times, and in the presence of Activity Blocks that are intended to be executed substantially at the same time in the course of the session, they are placed in different Activity Block Containers.
10
11. The system in accordance with Claim 10, wherein for designing applications that are to be executed in the system, each Activity Block Container is furnished with an interface module at those points where
15 the execution of an Activity Block or the Activity Block Container can be interrupted and it may be the turn of another OS task to be executed, thus enabling the sending and reception of Session Control Protocol messages to take place via this interface of the Activity Block Container without a need to deal with these messages of the protocol as part of
20 the application design work.
20
12. The system in accordance with the Claim 1, wherein the Resource Handlers are equipped with an interface for transmitting information between each Resource Handler and the system, this interface being substantially independent of the application session and the resource type.
25
25
13. The system in accordance with the Claim 1, comprising a dedicated Resource Instance Table in the use of each Resource Handler, and the Resource Handlers are designed to be without intermediate delayed states, wherein the changes of the status data of individual Resource Reservation Instances are stored in the Resource Instance Table of each Resource Handler.
30
30
14. The system in accordance with the Claim 1, wherein the Application Session Management and Scheduling means are associated with a Session History Table and the Resource Allocation
35
35

Manager are associated with a Resource Allocation Table, and the Application Session Management and Scheduling means and the Resource Allocation Manager are designed to be without intermediate states, wherein the changes of session-related status information is

5 stored in said Session History Table, and the changes of session-related information of Resource Reservation Instances are stored in said Resource Allocation Table.

10 15. The system in accordance with the Claim 1, comprising means ASM to determine the load condition of the processor and to adjust the power consumption of the processor on the basis of the load condition through the scheduling of the activities of the application sessions.

15 16. A method for executing application sessions in an electronic device with one or more processors for synchronizing Resource Reservation Instances as well as the execution of substantially simultaneous application sessions, wherein the application session to be executed comprises one or more Activity Blocks in one or more Activity Block Containers, and an execution order is determined for said Activity

20 Blocks, the method comprising at least the following steps:

- a resource management and allocation step for requesting and reserving resources for the application session,
- a bookkeeping and analysis step for saving and analysing the resource reservation situation,

25 - a scheduling and selection step for selecting the next application session and Activity Block to be executed at least on the basis of said resource reservation situation,

- an execution step for executing the next Activity Block in the course of the selected application session,

30 wherein in the method, a communication protocol connecting said resource management and allocation step, bookkeeping and analysis step, scheduling and selection step, and the execution step are used to control the execution order and, if necessary, to transfer information between said resource management and allocation step, bookkeeping and analysis step, scheduling and selection step, and execution step.

35

17. The method in accordance with Claim 16, wherein a bookkeeping of the resource allocation is maintained, and an first control message is transmitted to an Activity Block to provide control information on the resource allocation at the time of the initiation of the Activity Block, and

5 a second Control message is returned by the Activity Block to provide information about the resources reserved or released by the Activity Block to update the bookkeeping of the resource allocation situation after the completion of each Activity Block.

10 18. The method in accordance with Claim 17, wherein the resources needed by each Activity Block are reserved and released by the application session, either directly from resource type specific Resource Handlers or from the Resource Allocation Manager that enable the queuing of Reservation Request messages, on the basis of control

15 parameters received in a first control message received from Application Session Management and Scheduling means.

20 19. The method in accordance with Claim 17, wherein second control messages are used by the application session to dynamically assign Resource Reservation Instances to the use of different Activity Block Containers involved in the execution of the session, as needed.

25 20. The method in accordance with the Claim 16, wherein in the method, an Operating System is utilized comprising task switching functions, and that for synchronizing the reservation, release and other resource-related control from the Application Session Management and Scheduling means, Activity Block Containers, Resource Allocation Manager and the Resource Handlers, there is a Session Control Protocol composed of application-independent control messages and rules on their use, which is arranged, during its operation, to implement the synchronization and scheduling control of the execution of the Application Session Management and Scheduling means, the Activity Block Containers, the Resource Allocation Manager, as well as the Resource Handlers (RH), on the basis of the task switching functions of the Operating System as well as the OS task priorities defined for the Application Session Management and Scheduling means, the Activity

30

35

Block Containers, the Resource Allocation Manager, and the Resource Handlers.

21. The method in accordance with the Claim 16, wherein in the
5 method, a Resource Instance Table is used per each Resource Handler to provide the resource allocation situation to said Resource Allocation Manager, and the synchronization of the bookkeeping and analysis step with respect to the resource management and allocation step of the Resource Handlers is determined so that substantially
10 immediately after each execution turn of the Resource Handlers, it is the turn of the bookkeeping and analysis step, wherein the resource allocation situation is unambiguously known in the Resource Instance Tables regarding the changes occurred.
- 15 22. The method in accordance with Claim 21, wherein the scheduling of the scheduling and selection step with respect to the bookkeeping and analysis step is determined so that the scheduling and selection step is in turn substantially immediately after the execution of the bookkeeping and analysis step, wherein the resource allocation
20 situation is unambiguously known in the Resource Allocation Table regarding the latest changes occurred, and values can be determined by the Application Session Management and Scheduling means for the parameters of the control messages generated by it for the synchronization of the use of various types of Resource Reservation
25 Instances.
23. The method in accordance with the Claim 16, wherein an End State Module is placed at the end of each Activity Block to complete the execution of the block, and a Waiting State Module is placed in the
30 Activity Block Container holding the Activity Block, and the execution control of the Activity Block Container holding the Activity Block generates a second control message in the End State Module and pauses the execution in the Waiting State Module in order to wait for an first control message from the Application Session Management
35 and Scheduling means, wherein the execution of the application session is temporarily interrupted regarding the current Activity Block Container.

24. The method in accordance with Claim 23, wherein the Application Session Management and Scheduling means analyse the resource allocation situation and the scheduling of the sessions to be executed
5 to detect an overload condition of one or more resources and to manage it by replacing, as needed, application sessions with other application sessions requiring less resources, or by delaying, as needed, the transmission of first control messages to the application sessions, which results in a temporary suspension of the ongoing
10 application session, or in a delayed initiation of a new application session.

25. The method in accordance with the Claim 16, wherein the Activity Blocks of the application session are placed in one or more Activity Block Containers, Activity Blocks in any one of these Activity Block Containers are executed temporally at different times, and in the presence of Activity Blocks that are intended to be executed substantially at the same time in the course of the session, they are placed in different Activity Block Containers.
20

26. The method in accordance with Claim 25, wherein for designing applications that are to be executed in the system, each Activity Block Container is furnished with an interface module at those points where the execution of an Activity Block or Activity Block Container can be
25 interrupted and it may be the turn of another Operating System task to be executed, thus enabling the sending and reception of Session Control Protocol messages to take place via this interface of the Activity Block Container without a need to deal with these messages of the Session Control Protocol as part of the application design work.
30

27. The method in accordance with Claim 16, wherein the Resource Handlers are equipped with an interface for transmitting information between each Resource Handler of the system, this interface being substantially independent of the application session and the resource type.
35

28. The method in accordance with Claim 16, wherein a dedicated Resource Instance Table is in the use of each Resource Handler, and the Resource Handlers are designed to be without intermediate delayed states, wherein the changes of the status data of individual

5 Resource Reservation Instances are stored in the Resource Instance Table of each Resource Handler.

29. The method in accordance with Claim 16, wherein a Session History Table is in the use of the scheduling and selection step, and a

10 Resource Allocation Table is in the use of the bookkeeping and analysis step, the resource management and allocation step, bookkeeping and analysis step, as well as scheduling and selection step are designed to be without intermediate delayed states, wherein the changes of session-related status information is stored in said

15 Session History Table, and the changes of session-related information of the Resource Reservation Instances are stored in said Resource Allocation Table.

30. The method in accordance with Claim 16, wherein the load condition of the processor is determined, and the power consumption of the processor is adjusted on the basis of the load condition through the scheduling of the activities of the application sessions.

25 31. An electronic device comprising means for executing application sessions, one or more processors, and means for scheduling Resource Reservation Instances as well as the execution of substantially simultaneous application sessions, wherein the application session to be executed comprises one or more Activity Blocks in one or more Activity Block Containers, and an execution order is determined for

30 said Activity Blocks; the electronic device further comprising resource type specific Resource Handlers for reserving resources for the application session, Resource Allocation Manager for analysing and saving a resource allocation situation, Application Session Management and Scheduling means for selecting at least the next application session and Activity Block to be executed on the basis of

35 said resource allocation situation, executing means for executing the next Activity Block in the course of the selected application session;

and the electronic device is provided with a protocol connecting the Resource Handlers, Resource Allocation Manager, Application Session Management and Scheduling means and executing means, to control the execution order and to implement the transfer of information between said Resource Handlers, Resource Allocation Manager, Application Session Management and Scheduling means, and executing means.

5

32. An wireless communication device comprising means for executing application sessions, one or more processors, and means for scheduling Resource Reservation Instances as well as the execution of substantially simultaneous application sessions, wherein the application session to be executed comprises one or more Activity Blocks in one or more Activity Block Containers, and an execution order is determined for said Activity Blocks; the wireless communication device further comprising resource type specific Resource Handlers for reserving resources for the application session, Resource Allocation Manager for analysing and saving a resource allocation situation, Application Session Management and Scheduling means for selecting at least the next application session and Activity Block to be executed on the basis of said resource allocation situation, executing means for executing the next Activity Block in the course of the selected application session; and the electronic device is provided with a protocol connecting the Resource Handlers, Resource Allocation Manager, Application Session Management and Scheduling means and executing means, to control the execution order and to implement the transfer of information between said Resource Handlers, Resource Allocation Manager, Application Session Management and Scheduling means, and executing means.

10

15

20

25

30

35

32. A software program comprising machine executable steps for executing application sessions in an electronic device with one or more processors for synchronizing Resource Reservation Instances as well as the execution of substantially simultaneous application sessions, wherein the application session to be executed comprises one or more Activity Blocks in one or more Activity Block Containers, and an execution order is determined for said Activity Blocks, the software

program further comprising machine executable steps for performing at least the following steps:

- a resource management and allocation step for requesting and reserving resources for the application session,
- 5 - a bookkeeping and analysis step for saving and analysing the resource reservation situation,
- a scheduling and selection step for selecting the next application session and Activity Block to be executed at least on the basis of said resource reservation situation,
- 10 - an execution step for executing the next Activity Block in the course of the selected application session,
wherein the software program also comprises machine executable steps for using a communication protocol connecting said resource management and allocation step, bookkeeping and analysis step, scheduling and selection step, and the execution step to control the execution order and, if necessary, to transfer information between said resource management and allocation step, bookkeeping and analysis step, scheduling and selection step, and execution step.
- 15